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Health expenditure and health status in northern and Southern India: A comparative analysis

Shabnam Bahadur
Assistant Professor, Department of Economics, DCAC College, DU, New Delhi, India

Abstract
This study uses Almost Ideal Demand Systems (AIDS) model to present the health expenditure characteristics of Northern and Southern India using NSSO data of 71st round on Health and Education. We broadly keep positive analysis as to how various factors that comprise total health expenditure affect the weights given to each category of healthcare services. We found that more affluent state's budget share are more sensitive to change in respective prices. Demand for healthcare services is less elastic in north than south because south states have higher literacy rate, and better infrastructure, govt. administration etc. if prices of healthcare services go up they will response more than low income states. Also demand responsiveness of any good do not depend only on prices of goods there are many other factors which affect demand.

Keywords: depend, prices, response, Systems, responsiveness

Introduction

The rapid growth of health expenditure has become a great concern for both households and governments. There is extensive literature on the determinants of health expenditure in OECD countries, but the same is not true for developing countries. The aim of this study is to understand the trajectory of health expenditure in developing countries. Income (per capita GDP) has been identified as a very important factor for explaining differences across countries in the level and growth of total health care expenditures.

The importance of health care in modern day society can be gauged from the fact that good health is recognized as one of the fundamental rights of an individual. A comparison of the basic health indicators clearly indicates that developing country like India has lesser healthcare provision and utilisation than a developed country health expenditure can be categorized as out-of-pocket expenditure and prepayments. Prepayments are contributions made through general taxation, payroll tax, compulsory insurance and voluntary insurance. Out-of-pocket expenditures are the payments made directly by individuals at the point of service, where the entire cost of health good or service is not covered under any financial scheme. Healthcare budgeting is predominantly out-of-pocket payments in many developing and low-income countries.

Based on the characteristics of the service providers, healthcare services can be broadly classified as public and private. Public healthcare services are those healthcare services that are provided by government owned or controlled entities whereas private healthcare services are the ones provided by privately owned or controlled entities. Healthcare budgeting is predominantly out-of-pocket payments in many developing and low-income countries.

In 2013-14, household expenditure in India is estimated at Rs. 3,06,938 crores which equates to 2.72% of GDP and 72.87% of Current Health Expenditure (CHE). This is 67.74% of Total Health Expenditure (THE). It includes household prepayments (social and voluntary health insurance contributions) of Rs. 16,006 Crore and Out of pocket expenditures (OOPE) of Rs. 2,90,932 crores (94.79% of total HHE, 2.58% of GDP, 64.21% of THE and 69.1% of CHE and Rs. 2336 per capita).

Many studies have argued that inadequate resources and expenditure patterns is one of the main reasons for the low health status of people, and this could also explain the regional variations in health status. Thus there are policy challenges in the country of how to make development more equitable while improving the health status across different states. The effort on Indian health care system to widen health services of satisfactory quality to the vast majority of the citizens is increasingly facing various threats.

Some of the literature explains various combinations of healthcare expenditure with other household expenses i.e. food education, transport etc. and there exists great diversity of budget allocations of healthcare plans due to different contingencies and medical emergencies occurs.

This paper examines the effect of price indices of different healthcare variables (bed charges, medical expenses, doctor fee etc.) on budget share of household. Since healthcare budgeting is not similar across all states of a country like India. Our finding is to see the differences in budget share of household across states when prices of various health-related services changes.

The objective of this paper is to characterise the budget allocation of household depends on healthcare services and rising demand for medical expenditure in two different locations.

We also interested to see the effect of price changes over budget share in northern and southern states of India. One issue that arises from the foregoing studies is whether regional disparities are related to structure and flows health funds and financing in two locations. Other is to measure the impact of purchases of health care goods and services on the budget allocations of household through estimation techniques.

We are considering the budget diversification of two locations in India mainly North and South. Our main focus is on extreme lower income states in north i.e. Uttar Pradesh, Bihar etc. and in South i.e. Kerala, Tamilnadu etc. Since public budgets for health have increased significantly

for Bihar (70%) and substantially for Uttarpradesh (30%) in recent years. Whereas Kerala had the highest per capita expenditure of Rs1858 on health in 2001-02.
According to the report, the top five states that have per capita expenditure on health of more than Rs 1,000 are Kerala (Rs 1,858), Haryana (Rs 1,570), Punjab (Rs 1,530), Himachal Pradesh (Rs 1,305) and Uttar Pradesh (Rs 1,124) in recent years. The other states that had high per capita spending on curative care services, immunisation and other healthcare services were Jammu and Kashmir (Rs 1,061), Andhra Pradesh (Rs 1,039) and Maharashtra (Rs 1,011).

Literature Review
Olanrewaju Olaniyan & Akanni O. Lawanson **(**2011) found that health care financing in both the North and South of Nigeria is heavily dependent on household and the proportional share by the household is disproportionately against the North because of the higher poverty incidence in the north. With lower health financial flows in the North, the health outcomes in this region remain relatively significantly poor.
Reporting of morbidity and hospitalization rate had a pro-rich distribution in all three States indicating poor utilization of health services by low income households. Nearly 57 and 60 per cent households from poorest income quintile in Haryana and Punjab, respectively faced catastrophic OOP hospitalization expenditure at10 per cent threshold. Lower prevalence of catastrophic expenditure was recorded in higher income groups. Public sector also incurred high costs for hospitalization in selected three States. Medicines constituted 19 to 47 per cent of hospitalization expenditure and 59 to 86 per cent OPD expenditure borne OOP by households in public sector. Public sector hospitalizations had a pro-poor distribution in Haryana, Punjab and Chandigarh (Shankar Prinja *et al*. 2012)
The distribution of health care providers in the province with regard to sector of work (public/private), rural-urban location, qualification, commercial orientation and institutional set-up are described. Of the 24,807 qualified doctors mapped in the survey, 18,757 (75.6%) work in the private sector. Fifteen thousand one hundred forty-two (80%) of these private physicians work in urban areas. The 72.1% (67793) of all qualified paramedical staff work in the private sector, mostly in rural areas. The paper empirically demonstrates the dominant heterogeneous private health sector and the overall the disparity in healthcare provision in rural and urban areas. It argues for a new role for the public health sector, one of constructive oversight over the entire health sector (public and private) balanced with direct provision of services where necessary. It emphasizes the need to build strong public private partnerships to ensure equitable access to healthcare for all.
Economic Research Foundation (New Delhi). It is well known that health expenditure in India is dominated by private spending. To a large extent this is a reflection of the inadequate public spending that has been a constant if unfortunate feature of Indian development in the past half century. This is particularly unfortunate because of the large positive externalities associated with health spending, which makes health spending a clear merit good. The greater reliance on private delivery of health infrastructure and health services therefore means that overall these will be socially underprovided by private agents, and also deny adequate access to the poor. This in turn has adverse outcomes not only for the affected population but for society as a whole. It adversely affects current social welfare and labour productivity, and of course harms future growth and development prospects.

Data Description
We propose following factors affecting demand for healthcare services;

Medicine expenses (p1): Since medical expenses is a very important element in the demand for healthcare services. Many multivariate studies of hospital costs have included some measure of urban-rural location as a potentially important contributor to variations in hospital costs. These studies generally show that rural hospitals are less costly than urban hospitals.
Numerous studies performed during the 1980s and early 1990s have shown that as hospital market concentration increases (i.e., as the market moves from competition to monopoly), hospital costs decrease. But in villages people have low income comparatively to urban household so increment in medical expenses have more negative impact on demand for healthcare in rural areas. We are using medical expenses as a proxy variable for price of medicine.

Doctor surgeon fee (p2): India continues to struggle with providing basic medical care for its citizens. After two decades of strong economic growth, life expectancy in India falls short of most developed and developing nations; the infant mortality rate is three times higher than China's and seven times higher than the U.S.The cost of care is also keeping citizens from getting proper treatment, or any treatment at all. Rising private healthcare costs and a lack of quality, affordable alternatives are forcing high out-of-pocket expenses that exacerbate the problem. So as doctor fee increases has opposite impact on demand for healthcare services in rural areas. We can expect negative sign in our model.

Bed charges (p3): As we know that in India there is larger income inequality. Around 70% household depends on agriculture so they have risky source of income (because their income depends on agriculture and agriculture in sensitive to rain, weather etc.) and from total income farmer spend 90% (approx.) on food so they left with very low income spend on healthcare services. In the case of if bed charges increase even a low proportion then these people are less likely to go hospital. But they have some other options for treatment like government hospitals but the proportion of government hospitals dispensary are very low in rural areas so this is the problem for the villagers. So increment bed charges have negative impact on access to healthcare services. Which we will find in result section.

Medicines (p4): Medicine costs continue to account for a large share of all out-of-pocket health expenses incurred by Indians, a new report showed. Out of all health expenditure, 72% in rural and 68% in urban areas was for buying medicines for non-hospitalized treatment, according to the 'Health in India' report, which draws data from the 71st round of the National Sample Survey conducted from January to June 2014. Data from the 60th round of NSSO, which was conducted in 2004, too had shown that 70% of out-of-pocket medical expenditure is on medicines.

Diagnostic test (p5): In a private hospitals are more likely to suggest for diagnostic test in comparison to government hospitals wealthy people are more likely to access but poor villagers cannot afford it. Rural communities face barriers when accessing health services. In response, numerous initiatives have focused on fostering technological innovations, new management approaches and health policies. Three types of barriers emerged. The first barrier was the limited access to point of care (POC) diagnostic tools. Tests were needed for: i) the differential diagnosis of malaria vs. pneumonia, ii) dengue vs. leptospirosis, iii) tuberculosis, iv) vaginal infections and cervical cancer, v) neurocysticercosis, and vi) heavy metal toxicity. Ultrasound was needed for the diagnosis of obstetric and intra-abdominal conditions. There were also health system-related barriers such as limited funding for diagnostic services, limited laboratory services and access to telecommunications, and lack of institutional support. Finally, the third type of barriers included patient related-barriers to follow through with diagnostic referrals. Ideas for innovations proposed included POC equipment and tests, and telemedicine. We are expecting negative sign in our model for this as well. We are taking cost of diagnostic test as proxy variable for prices for use diagnostic services.

Other medical expenditures (p6): Residents in urban areas paid less than residents in rural areas for accommodation and transportation. Poor households paid less for diagnosis and medicine, but more for transportation related to inpatient care. Non-medical spending for inpatient care among the poor should be considered for affordable and accessible health-care utilization. Increment in Other Medical expenditure decreases expenditure on healthcare services.

Transportation cost for patient (p7): In any population, missed medical appointments (treatment non-adherence) results in poor health outcomes. There are many reasons cited by patients for missing appointments, including not being able to leave work, inability to find child care, and lack of health insurance, but transportation related challenges are one of the most often mentioned. This connection between transportation challenges and the ability to keep medical appointments has been discussed in several studies; and, although anecdotal evidence abounds, we still do not have comprehensive data to determine the ultimate impact that transportation barriers have on health outcomes. Researchers reported that anywhere from 3% to 67% of the population sampled reported a lack of transportation as a barrier to healthcare. Transport is also necessary element for serious patient to get admit in hospital. We are taking transport cost as a proxy variable for price of transport. We are expecting negative sign for this variable.

Price of other non-medical services/goods (p8): Non-medical spending for inpatient care among the poor should be considered for affordable and accessible health-care utilization. Increment in Other Medical expenditure decreases expenditure on healthcare services. Other nonmedical expenditure has significant impact on healthcare services.

Methodology

We use NSSO 71th round Annual Survey data to explain the demand for healthcare services in India. The data is available for northern states (which includes, Jammu & Kashmir, Himachal Pradesh, Punjab, Chandigarh, Uttrakhand, Haryana, Delhi, Rajasthan, Uttar Pradesh) and southern states (Andhara Pradesh, Karnatka, Lakshadweep, Kerala, Tamil Nadu, Puducherry, Andman & Nicobar Island, Telangana).[2] Further, the sample is distributed evenly across the household and proportionately across the states. Thus, the sample fairly represents effect of prices of healthcare services (such as doctor fee, Bed charge, medicine expense etc.) on budget share of healthcare expenditure of the country.

It is difficult to quantify the price for Healthcare services. Economists and social scientists have used several variables as proxies for the same. We uses the household's individual expenditure (such as Bed charge, Medicine expenses, Doctor fees etc.) for prices of Healthcare services. The authors also use the same variable since it captures variation in the household expenditure on healthcare services in northern and southern states.

The empirical model that the authors use to define the Budget share of Health expenditure in total household expenditure outcome is:

$$\omega_i = \alpha_i + \sum^{n}_{j=1} \gamma\, gp_j + \beta_i log\{x/p\} \qquad (1)$$

Where p is the price index defined by,

$$\text{LogP} = \alpha_o + \sum_k \alpha_k \, logp_k + \frac{1}{2}\sum_j \sum_k \gamma_{kj} \, logp_k logp_j \qquad (2)$$

Where ωi is the explained variable (the share of health expenditure), αo denotes the state fixed effects, pj denotes the Prices of different services of healthcare, (x) denotes the household. We take these three sets of restriction,

$$\sum_{i=1}^{n} \alpha_i = 1 \; \sum_{i=1}^{n} \gamma_{ij} = 0 \; \sum_{i=1}^{n} = 0 \qquad (3)$$

$$\sum_j = 0 \qquad (4)$$

$$= \gamma_{ji} \qquad (5)$$

Provided (2), (3) and (4) hold, equation (1) represent a system of demand functions which add up to total expenditure $(\sum_{i=1}^{n} \omega_i = 0)$ are homogenous of degree zero in prices and total expenditure taken together and which satisfy Slutsky symmetry.

Estimation can be carried out by substituting (2) in (1) to give

$$\omega_i = (\alpha_i - \beta_i \alpha_o) + \sum_j \gamma_{ij} \, logp_j + \beta_i \{logx - \sum_k \alpha_k \, logp_k - \frac{1}{2} \sum_k \sum_j \gamma_{kj} \, logp_k logp_j\}$$

We can use stone's price index to calculate AIDS equation, which is log p* = $\sum_k \omega_k \, logp_k$

Where P ≅ ∅P*, then (1) can be estimated as

$$\omega_i = (\alpha_i - \beta_i \log \emptyset) + \sum_j \gamma_{ij} \, logp_j + \{log \frac{X}{p^*}\}$$

Main Results

The paper provides an empirical analysis of the allocation of public expenditure across the components of health care using a formal microeconomic framework. We estimate a complete system of demand for public health care using a static and flexible function form (Almost Ideal Demand System) and nsso-71th data on health expenditure on two Indian regions (i.e. northern and southern). The approaches give us some evidence that the microeconomic agents allocating his budget resources across the sub-sectors of health in response to exogenous prices and need.

Table 1: Results for Southern States

Dependent Variables→ **Independent Variables↓**	**w1**	**w2**	**w3**	**w4**	**w5**	**w6**	**w7**	**w8**
log_p1	NA	.02493*** (.00054)	.03201*** (.00037)	.0236*** (.00044)	.034*** (.00035)	.0358*** (.00039)	.0403*** (.00031)	.0359*** (.00037)
log_p2	-.00674*** (.00009)	NA	-.00719*** (.00013)	-.0064*** (.00018)	-.007*** (.00012)	-.0071*** (.00013)	-.0069*** (.00009)	-.0067*** (.00011)
log_p3	-.00737*** (.00011)	-.00630*** (.00019)	NA	-.0081*** (.00019)	-.008*** (.00013)	-.0083*** (.00014)	-.0085*** (.00010)	-.0081*** (.00012)
log_p4	-.00768*** (.00012)	-.00644*** (.00027)	-.00869*** (.00018)	NA	-.008*** (.00017)	-.0089*** (.00018)	-.0079*** (.00012)	-.0079*** (.00015)
log_p5	-.00688*** (.00010)	-.00677*** (.00017)	-.00776*** (.00012)	-.0070*** (.00016)	NA	-.0073*** (.00012)	-.0074*** (.00008)	-.0077*** (.00010)
log_p6	-.00639*** (.00008)	-.00580*** (.00014)	-.00675*** (.00010)	-.0062*** (.00013)	-.006*** (.00009)	NA	-.0065*** (.00007)	-.0064*** (.00008)
log_p7	-.00405*** (.00008)	-.00368*** (.00012)	-.00388*** (.00009)	-.0038*** (.00011)	-.004*** (.00008)	-.0033*** (.00008)	NA	-.0039*** (.00007)
log_p8	-.00659*** (.00010)	-.00583*** (.00014)	-.00580*** (.00010)	-.0064*** (.00014)	-.006*** (.0001)	-.0049*** (.00010)	-.0057*** (.00007)	NA
Log(X/p*)	.09836*** (.00036)	.09650*** (.00022)	.09920*** (.00019)	.0971*** (.00021)	.0988*** (.00019)	.095*** (.00019)	.1052*** (.00026)	.1041*** (.00018)
_cons	.21349*** (.00102)	-.11300*** (.00122)	-.14467*** (.00105)	-.0747*** (.00128)	-.1620** (.00094)	-.1755*** (.00091)	-.2194*** (.00103)	-.1869*** (.00108)
R-Squared	0.9712	0.9897	0.9846	0.9855	0.9846	0.9835	0.9702	0.9864
Number of obs.	4923	5053	5035	4926	5131	6088	5422	5135

Parenthesis contains standard errors. NA: Not Applicable

*** Significant at 1%, level ** Significant at 5% level and *Significant at 10% level

For southern states

Here, we choose the AIDS model pioneered by Deaton and Muellbauer (1980) [1]. We have estimated the budget shares of healthcare expenditure on the different price indices from regressing the equation 1.we estimated a complete system of demand for healthcare using a static approach. We got our results for southern states of India in table1.the 1st column shows the budget share of medical expenditure with change in the prices of other services. The increase in 1% change in price of surgeon fee will reduce the budget share of household by 0.67units of total expenditure and also bed charges and medicine give highly significant effect on budget share of medical expenditure decrease by,0.73 units and 0.76 units respectively.an increase in prices of medical expenditure increases the budget share of all variables because when prices increases household more likely starts approaching towards free medical facilities and govt. hospitals and pharmacies.

Doctor surgeon fee is also found that cost of quality treatment and availability is highly statistically significant for household budget allocation. And we know that bed charges, medicines &diagnostic test are complements so all three have more impact on budget share of surgeon fee.

The budget share for diagnostic test (5th column) is also coming out statistically significant but have lesser effect of other variable,1% increase in prices of any variable reduce the budget share W5 by less than 0.35 units. We also find that budget share of other medical expenses also largely significant. However, increase in price of transport facility will reduce the budget share significantly but effect is not very high means expenditures on transport merely affect budget share of healthcare expenditure.

We also find that budget shares also constant and negative even in absence of the entire vector of prices. All results are significant at 1% level which shows that if we do not considers price effect budget share of all variables decreases because of need of other household expenses like education, food etc. If there is an increase in real total expenditure(X), the budget share of all variables increases specially in surgeon fee, bed charges, medicines and diagnostic test. Since this effect is lower in other non-medical expenses. Also vector of prices of AIDS model negatively affect budget shares wi. The above flexible functional form turns out to be good-fit in our specification because all correlation coefficients are very high and close to 1.so all variable are highly correlated, which shows that in south region budget shares of household highly responds to any change in price indices.

Testing parametric restrictions on regression equations of southern states:

Adding up restriction:- $\sum_{i=1}^{8} \alpha_i = -0.86195, \quad \sum_{i=1}^{8} \beta_i = 1.6899$

$\sum_{i=1}^{8} \gamma_{i1} = 0.1743$ $\quad \sum_{i=1}^{8} \gamma_{i2} = -0.4327$

$\sum_{i=1}^{8} \gamma_{i3} = -0.522$ $\quad \sum_{i=1}^{8} \gamma_{i4} = -0.0532$

$\sum_{i=1}^{8} \gamma_{i5} = -0.5147$ $\quad \sum_{i=1}^{8} \gamma_{i6} = -0.04456$

$\sum_{i=1}^{8} \gamma_{i7} = -0.02806$ $\quad \sum_{i=1}^{8} \gamma_{i8} = -0.04198$

First two parametric restrictions are not satisfying for adding up and third set of restrictions is weakly satisfying that is $\sum^{8}{}_{i=1}\gamma_{ij} \cong 0$ Since all three Parametric restriction are not satisfying therefore adding upnot satisfy for budget share equations of southern states.

Homogeneity restriction:-

$\sum_{j=1}^{8} \gamma_{1j} = -0.0457$ $\quad \sum_{j=1}^{8} \gamma_{5} = 0.003$

$\sum_{j=1}^{8} \gamma_{2j} = -0.00989$ $\quad \sum_{j=1}^{8} \gamma_{6j} = -0.004$

$\sum_{j=1}^{8} \gamma_{3j} = -0.00805$ $\quad \sum_{j=1}^{8} \gamma_{7j} = 0.0059$

$\sum_{j=1}^{8} \gamma_{4j} = -0.0143$ $\quad \sum_{j=1}^{8} \gamma_{8j} = -0.0048$

It is clearly seen from homogenous restriction that $\sum^{8}{}_{i=1}\gamma_{ij}$ is approximately zero for budget share of all healthcare services, therefore, homogeneity restriction is satisfy for regression equation of Southern states.

Symmetry:- In input output matrix of Southern states it is clearly shown that symmetry is not satisfy for all budget share's. Coefficient of Surgeon fees on budget share of medical expenditure is -.00674 but coefficient of price of medical services on budget share of surgeon is.02493 therefore $\gamma 12 \neq \gamma 21$ which is happening with all budget shares.

Table 2: Results for Northern States

Dependent Variables→ / Independent Variables↓	w1	w2	w3	w4	w5	w6	w7	w8
log_p1	NA	.030905*** (.000766)	.026842*** (.000515)	.0241*** (.00056)	.0324*** (.00044)	.0356*** (.00041)	.0388*** (.00037)	.03545*** (.00042)
log_p2	-.00548*** (.000096)	NA	-.00334*** (.000113)	-.0059*** (.00019)	-.0061*** (.00012)	-.0063*** (.00011)	-.0060*** (.00009)	-.00615*** (.00010)
log_p3	-.00671*** (.000138)	-.00551*** (.000224)	NA	-.0074*** (.00023)	-.0077*** (.00015)	-.0076*** (.00014)	-.0075*** (.00010)	-.00737*** (.00012)
log_p4	-.00681*** (.000157)	-.00824*** (.000423)	-.00517*** (.000283)	NA	-.0081*** (.00022)	-.0081*** (.00021)	-.0070*** (.00016)	-.0069*** (.00018)
log_p5	-.00734*** (.000147)	-.00826*** (.000275)	-.0076*** (.000208)	-.0079*** (.000248)	NA	-.0077*** (.00014)	-.0076*** (.00011)	-.0078*** (.00013)
log_p6	-.00647*** (.000124)	-.00715*** (.000237)	-.00621*** (.000175)	-.0068*** (.00020)	-.0068*** (.00013)	NA	-.0067*** (.00010)	-.0067*** (.00011)
log_p7	-.00490*** (.000109)	-.00442*** (.000188)	-.00473*** (.000147)	-.0045*** (.00017)	-.00410*** (.00011)	-.0039*** (.00010)	NA	-.0041*** (.00009)
log_p8	-.00666*** (.000137)	-.00581*** (.000226)	-.00636*** (.000177)	-.0060*** (.00021)	-.0059*** (.00013)	-.0055*** (.00012)	-.0062*** (.00009)	NA
Log(X/p*)	.09428*** (.000413)	.09377*** (.000294)	.09960*** (.000258)	.0953*** (.00027)	.0973*** (.00024)	.0949*** (.00023)	.1039*** (.00030)	.10045*** (.00026)
_cons	.22643*** (.001205)	-.12981*** (.00171)	-.15145*** (.001473)	-.0693** (.00164)	-.1538*** (.00012)	-.1832*** (.00097)	-.2139*** (.00122)	-.18898*** (.00127)
R-Squared	0.9681	0.9855	0.9800	0.9861	0.9823	0.9809	0.9755	0.9811
Number of obs.	3091	3441	3445	3099	3231	4279	3454	3249

Parenthesis contains standard errors. NA: Not Applicable

*** Significant at 1%, level ** Significant at 5% level and *Significant at 10% level

For northern states

We also have estimated the budget shares of healthcare expenditure on the different price indices from regressing the equation 1. We estimated a complete system of demand for healthcare using a static approach in northern states. We found that in northern states all seven service (i.e. variables) component prices have significant negative impact on budget share of medical expenditure. It shows that if price

of bed increase by one percent then on an average our budget share of medical expenditure increase by 0.67unit. Also if we see all other components of healthcare service's budget share then we can conclude that prices have negative impact on all components budget share. Except fixed effect of medical expenditure (W1) all fixed effects are negative. The effect of medical expenditure price have positive impact on services budget share. We can also see some states in the northern region are not prosperous in comparison to some affluent states in southern region therefore we conclude some significant remarks that fixed effect is different over regions. All results are similar according to our expectations.

Real total expenditure(X) increase due to increase in budget share of all variables, specially, in surgeon fee, bed charges, medicines and diagnostic test. Since this effect is lower in other non-medical expenses. We also get that the correlation coefficients are close to one which shows that our results are best fitted according to estimation technique (i.e. AIDS).

Testing parametric restrictions on regression equations of northern states:

Adding up restriction:- $\sum_{i=1}^{8} \alpha_i$ = -0.67503, $\sum_{i=1}^{8} \beta_i$ = 0.7795

$\sum_{i=1}^{8} \gamma_{i1}$ = 0.224 $\sum_{i=1}^{8} \gamma_{i2}$ =- 0.03927

$\sum_{i=1}^{8} \gamma_{i3}$ = -0.0422 $\sum_{i=1}^{8} \gamma_{i4}$ = -0.05032

$\sum_{i=1}^{8} \gamma_{i5}$ = -0.0512 $\sum_{i=1}^{8} \gamma_{i6}$ = -0.04683

$\sum_{i=1}^{8} \gamma_{i7}$ = -0.03065 $\sum_{i=1}^{8} \gamma_{i8}$ = -0.0423

First two parametric restrictions are not satisfying for adding up and third set of restrictions is weakly satisfying that is $\sum_{i=1}^{8} \gamma_{ij} \cong 0$ Since all three Parametric restriction are not satisfying therefore adding up not satisfy even this result is slightly better than southern states.

Homogeneity restriction:-

$\sum_{j=1}^{8} \gamma_{1j}$ = -0.03105 $\sum_{j=1}^{8} \gamma_{5j}$ = -0.0063

$\sum_{j=1}^{8} \gamma_{2j}$ = -0.03939 $\sum_{j=1}^{8} \gamma_{6j}$ = -0.0035

$\sum_{j=1}^{8} \gamma_{3j}$ = -0.003228 $\sum_{j=1}^{8} \gamma_{7j}$ = -0.0022

$\sum_{j=1}^{8} \gamma_{4j}$ = -0.0144 $\sum_{j=1}^{8} \gamma_{8j}$ = -0.00357

It is clearly seen from homogenous restriction that $\sum_{i=1}^{8} \gamma_{ij}$ is approximately zero for Budget share of all healthcare services therefore homogeneity restriction is satisfy for regression equation of Northern states.

Symmetry: In input output matrix of Northern states it is clearly shown that symmetry is not satisfying for all budget shares. Moreover, the coefficient of Surgeon fees on budget share of medical expenditure is -.00548 but coefficient of price of medical services on budget share of surgeon is.03095 therefore $\gamma 12 \neq \gamma 21$ which is happening with all budget shares.

For combined states

When we applied similar mechanism to the combined states, we got almost similar results, therefore, we will just look at the parametric restrictions as follow.

Testing parametric restrictions on regression equations of southern and northern states (combined)

Adding up restriction:- $\sum_{i=1}^{8} \alpha_i$ =-0.6740 , $\sum_{i=1}^{8} \beta_i$ = 0.7903379

$\sum_{i=1}^{8} \gamma_{i1}$ =0.2096 $\sum_{i=1}^{8} \gamma_{i2}$ = -0.03655

$\sum_{i=1}^{8} \gamma_{i3}$ =-0.049 $\sum_{i=1}^{8} \gamma_{i4}$ = -0.0532

$\sum_{i=1}^{8} \gamma_{i5}$ = -0.5162 $\sum_{i=1}^{8} \gamma_{i6}$ = -0.0447

$\sum_{i=1}^{8} \gamma_{i7}$ -0.0282 $\sum_{i=1}^{8} \gamma_{i8}$ = -0.042

First two parametric restrictions are not satisfying for adding up and third set of restrictions is weakly satisfying that is $\sum_{i=1}^{8} \gamma_{ij} \cong 0$ Since all three Parametric restriction are not satisfying therefore adding up not satisfy for budget share equations of southern and northern states (combined).

Table 3: Results for Northern and Southern States (Combined)

Dependent Variables→ / Independent Variables↓	w1	w2	w3	w4	w5	w6	w7	w8
log_p1	NA	.0272725*** (.0004484)	.0275591*** (.0003074)	.0234*** (.00034)	.03330*** (.000274)	.03563*** (.000282)	.03942*** (.000241)	.02340*** (.00023)
log_p2	-.0062281*** (.0000662)	NA	-.0043656*** (.0000848)	-.0062*** (.0012)	-.00674*** (.000087)	-.00673*** (.000087)	-.00651*** (.00006)	-.00651*** (.000077)
log_p3	-.0070681*** (.000091)	-.0058439*** (.0001473)	NA	-.0077*** (.0001)	-.00805*** (.00010)	-.00796*** (.00010)	-.00779*** (.000074)	-.00780*** (.000089)
log_p4	-.0073328*** (.000099)	-.0071177*** (.000236)	-.006683*** (.0001639)	NA	-.00842*** (.000137)	-.00856*** (.000141)	-.00757*** (.000099)	-.00753*** (.000119)
log_p5	-.0069713*** (.0000862)	-.0073776*** (.0001521)	-.0074742*** (.0001161)	-.0072*** (.00013)	NA	-.00745*** (.00009)	-.00742*** (.000070)	-.00773*** (.00008)
log_p6	-.0063702*** (.0000706)	-.0063241*** (.0001272)	-.0061728*** (.000096)	-.0063*** (.00012)	-.00666*** (.00007)	NA	-.006507	-.00646*** (.000070)
log_p7	-.0043091*** (.0000647)	-.0040315*** (.0001032)	-.0042901*** (.0000826)	-.0041*** (.00010)	-.00383*** (.000066)	-.00363*** (.000065)	NA	-.00404*** (.000058)
log_p8	-.0067557*** (.000084)	-.0058446*** (.0001241)	-.0060028*** (.0000993)	-.0064*** (.00012)	-.00602*** (.000080)	-.00513*** (.000079)	-.0059*** (.00006)	NA
Log(X/p*)	.0965038*** (.0002769)	.0953236*** (.0001785)	.1004105*** (.0001626)	.0965*** (.00017)	.09842*** (.000080)	.09543*** (.000149)	.1046*** (.000200)	.10315*** (.000154)
_cons	.2186829*** (.0007802)	-.1202811*** (.0010137)	-.1463564*** (.0009107)	-.0724*** (.00101)	-.15871*** (.000740)	-.17798*** (.000671)	-.2167*** (.000787)	-.18876*** (.000839)
R-Squared	0.9696	0.9880	0.9808	0.9857	0.9835	0.9823	0.9720	0.9843
Number of obs.	8014	8494	8480	8025	8362	10367	8876	8384

Parenthesis contains standard errors. NA: Not Applicable
*** Significant at 1%, level ** Significant at 5% level and *Significant at 10% level

Homogeneity restriction:-

$\sum_{j=1}^{8} \gamma_{1j}$ =-0.0514 $\quad$ $\sum_{j=1}^{8} \gamma_{5j}$ = -0.00642

$\sum_{j=1}^{8} \gamma_{2j}$ = -0.00926 $\quad$ $\sum_{j=1}^{8} \gamma_{6j}$ = 0.01684

$\sum_{j=1}^{8} \gamma_{3j}$ = -0.0074 $\quad$ $\sum_{j=1}^{8} \gamma_{7j}$ = -0.00356

$\sum_{j=1}^{8} \gamma_{4j}$ =-0.01632 $\quad$ $\sum_{j=1}^{8} \gamma_{8j}$ = -0.00894

It is clearly seen from homogenous restriction that $\sum^{8}{}_{i=1} \gamma_{ij}$ is approximately zero for Budget share of all healthcare services therefore homogeneity restriction is satisfy for regression equation of Northern states.

Symmetry: In input output matrix of Northern states it is clearly shown that symmetry is not satisfy for all budget share's. Coefficient of Surgeon fees on budget share of medical expenditure is -.006281 but coefficient of price of medical services on budget share of surgeon is.027275 therefore $\gamma 12 \neq \gamma 21$ which is happening with all budget shares.

Since in our analysis we don't have own price effect of demand of healthcare services in cross state comparison of northern and southern region because in general it is very difficult to do analysis for any necessity commodity which is healthcare services in our analysis therefore parameter restriction of Negativity is not satisfying for all output matrix. it is clearly shown in all input- output matrix that budget share equation is homogenous but all other property of Demand function is not satisfy, since homogenous restriction is satisfying for all therefore we still have the reason to believe that budget share equation are Almost Ideal Demand System.

Policy Implications

As doctor surgeon fee rises by a percentage budget share of medical expenditure decreased by 5.8 percentage point in northern states but in southern states budget share of medical expenditure also decrease but magnitude is higher which is 6.74 percentage point and in general overall northern and southern states magnitude is 6.2 percentage point, all coefficient are highly significant. which shows that as doctor surgeon fees increases frequency of population will go to hospital decrease because of higher cost of healthcare index therefore budget share of medical expenditure decrease, since decrease in proportion of household will purchase healthcare service is higher in southern state, because it is very well know that southern state are higher income state so there may be possibility that people are health conscious and more physically and mentally fit than other state people so they don't need to purchase medicines therefore they have more decline in budget share of medical expenditure.

Similarly as bed charge increase by a percentage, budget share of medical expenditure decline by 6.7 percentage point in northern states but 7.3 percentage point in southern states and 6.7 percentage point in overall northern and southern states which is same as in northern states, all coefficient are highly significant. Which shows that frequency of people access to healthcare services decline who have more serious disease which is higher in northern states as compared to southern states. There seems a possibility that southern states having low well-being as compared to northern states since they have less money or resources to spend to more serious disease and as bed charge increase they can't afford healthcare services so decline in budget share of medical expenditure is higher in northern sates comparatively.

By combing all as doctor surgeon fees, bed fee, expenditure on medicine, price of diagnostic test, price of other medical and non–medical expenses increases budget share of medical expenditure decrease more in northern states as compare to southern states because as we already mention that northern household have more income and wealth so they are very health conscious means more care about their health and mortality rate is lower so they are more mentally and physically fit they don't need more healthcare services comparatively, therefore budget share of healthcare services more decrease as compare to southern states.

As real income of household increase by a percentage so it is clearly shown from all input-output matrix that budget share of all healthcare services increase which is higher in southern states which means that as we know southern states have less resource and money income or wealth but as those increases by real income there may be more chance to access health care services which causes increases in more budget share of all healthcare services.

Since demand of healthcare services is inelastic means that there is no substitution effect which means as price of healthcare services increase there is no change in quantity demand of healthcare in general but in our analysis which is of negative sign and highly statistically significant. Since healthcare services are Normal good which means that as real income increase share of healthcare services increases in general, which is satisfying in our analysis and coefficient of $\log\left(\frac{x}{P*}\right)$ is highly statistically significant in all southern and northern region.

Conclusion

We can conclude that more affluent state's budget share are more sensitive to change in respective prices. Demand for healthcare services is less elastic in north than south because south states have higher literacy rate, and better infrastructure, govt. administration etc. if prices of healthcare services go up they will response more than low income states. Also demand responsiveness of any good do not depend only on prices of goods there are many other factors which affect demand. We generally cannot clearly say that whether these effects exist in real scenario or not. In our methodology all the variables like surgeon fee, bed charges, medicine fee etc. are jointly required which means perfect complements. Household cannot substitute among these necessities.

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